Soil Health and Nitrogen Stewardship

Improving soil health and management of nitrogen sources can help meet individual farm production and economic goals while contributing to nationwide efforts to mitigate greenhouse gas (GHG) emissions by increasing soil carbon sequestration and reducing nitrous oxide emissions).

Soil Health

The centerpiece of soil health is increasing soil organic matter, i.e. soil carbon sequestration. Soil carbon can be increased by increasing a) the use of cover crops, b) the use of perennial crops, c) judicious use of organic inputs, and d) reducing tillage. There are a number of challenges to implementing these strategies more broadly in the Northeast under current and future conditions.

Challenges to increasing the use of cover crops to increase GHG mitigation include:

1. Not enough time to get covers established (late planting results in poor performance)
2. Field operation costs
3. Lack of information on the immediate benefits
4. Lack of good management information
5. Limited access to quality seed
6. http://www.nwf.org/~/media/PDFs/Global-Warming/Policy-Solutions/Cover_Crops_Roadmap%20Report_12-12-12.ashx

Challenges to increasing use of perennial crops to increase GHG mitigation include:

1. Lack of equipment
2. Lack of experience
3. Limited markets

Challenges to increasing judicious use of organic inputs to increase GHG mitigation include:

1. Costs of transporting manures

Challenges to increasing use of reduced tillage to increase GHG mitigation include:

1. Continuous no-till systems may not increase soil C, especially in NE soils (e.g. Baker et al.); rotational tillage less effective than continuous no-till in sequestering soil C
2. No-till may reduce yields compared to tilled systems (recent pub)
3. Cold soils in spring without tillage limit applicability, especially north of Pennsylvania

Climate change may increase opportunities for no-till systems and use of cover crops, particularly given that the region is expected to experience longer growing seasons, but wetter springs may cancel this benefit. In addition, mitigating GHG emissions is not a priority for

farmers—other benefits of soil health may trump GHG mitigation as primary means of adopting soil health strategies.

Nitrogen Stewardship

Nitrogen stewardship generally focuses on the 4 R's of nitrogen fertilizer management: using the Right Source, Right Rate, Right Timing and Right Placement of nitrogen fertilizers to improve nitrogen use efficiency (NUE), i.e. increasing the proportion of N inputs that are taken up by the crop. Increasing NUE generally results in decreased losses to the environment, including emissions of nitrous oxide (N_2O), a powerful GHG and catalyst of stratospheric ozone decline. Right Rate and Right Timing are principle strategies to increase NUE.

Challenges to increasing NUE with 4 R's:

1. Farmers are reluctant to reduce N rates due to perceived yield loss
2. Split applications require an additional pass across the field (time and fuel costs)
3. Farmers that adopt nutrient management plans may not implement them (University extension trusted less than fertilizer dealers)

Nitrogen stewardship could be broadened to include less commonly used organic sources of nitrogen, including legume cover crops and animal manures, and better accounting for soil pools of N (via soil testing).

Building Block Goals

Soil Health: Integrate with the NRCS Soil Health Initiative and promote more than ten NRCS conservation practices that improve soil organic matter, reduce emissions from soils and equipment, and promote healthier soils nationwide.

N Stewardship: Through 4 "R's" reduce nitrous oxide emissions and provide cost savings.

Core issue for workshop: How can USDA programs address challenges to identified above?